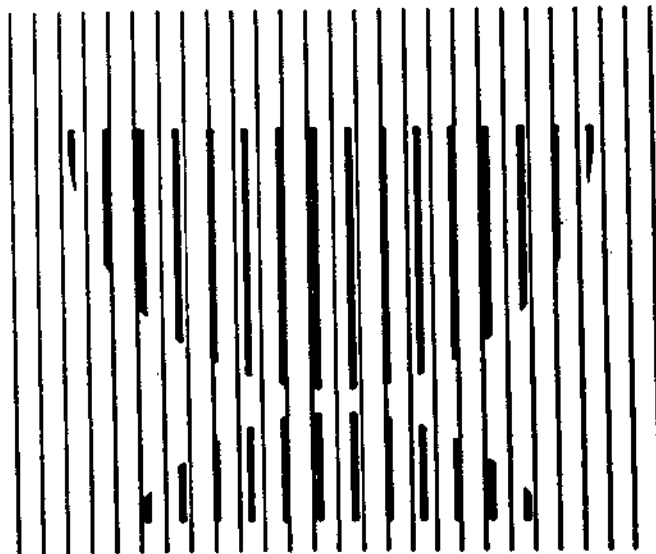


CBO STAFF MEMORANDUM

THE LONG-TERM COSTS OF NAVAL FORCES

MAY 1993



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This memorandum on the long-term costs of naval forces was prepared by the Congressional Budget Office (CBO) in response to a request from the Chairman of the House Committee on Armed Services. The memorandum updates a similar analysis, completed in December 1991, of the costs of the Bush Administration's plan for the Navy through the year 2010.

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INTRODUCTION AND SUMMARY

In response to threats posed by the former Soviet Union, the Reagan Administration advocated building a 600-ship Navy. The Navy never achieved this level, however. In fact, the fleet never exceeded 570 ships.

As the Soviet threat declined, the Bush Administration proposed a fleet of 450 ships, including 13 aircraft carriers (12 deployed and 1 for training). Recently, the Clinton Administration has recommended that the naval fleet be reduced to 413 ships by 1994. The new Administration will not submit a long-term plan for naval or other military forces until later this year or early next year. Press reports suggest, however, that the Navy is considering a further reduction in the size of the fleet to about 330 ships, including 12 carriers, by 1999.

Although the size of the fleet is declining, the Navy is still developing expensive new aircraft that it will begin purchasing in the late 1990s and the next decade. For 1994, the Navy has requested \$1.4 billion to finance development of the F/A-18E/F multirole aircraft and \$400 million for the A/FX medium-attack aircraft. The Navy will probably develop a new attack submarine and a new surface combat ship, which would be purchased primarily after the turn of the century. These expensive new weapons will have to be financed out of budgets that most likely will be considerably smaller than those of the 1980s.

How much will it cost to buy the weapons now being developed? Will enough funds be available to pay for them while also providing adequate support for smaller, but still substantial, naval forces? This paper examines the question of affordability in the next decade, when the Navy's large bills will come due. It does not try to estimate costs over the next few years. Nor does it assess whether planned naval forces are appropriate in view of the changing threats to U.S. security. The answers to those questions should emerge from the review of forces and weapons now under way in the Department of Defense.

Long-Term Costs of Possible Plan for a 330-Ship Navy

The Navy is apparently considering a future fleet of about 330 ships. A fleet of this approximate size might include 12 aircraft carriers, 91 surface combatants, 48 attack submarines, 50 amphibious ships, and 18 ballistic missile submarines.¹ The reduction in fleet size would sharply reduce the need to buy attack submarines and surface combatants throughout much of

1. See "Navy Plan Forecasts Radical Changes for Service During the 1990s," *Inside the Pentagon*, March 25, 1993.

the next decade. But the cost estimates in this paper assume that the Navy would continue to buy a few of these ships to maintain an industrial base capable of producing them. This analysis also assumes that the Navy will modernize its aircraft fleet, buying the F/A-18E/F aircraft beginning in the late 1990s and the A/FX aircraft late in the next decade.

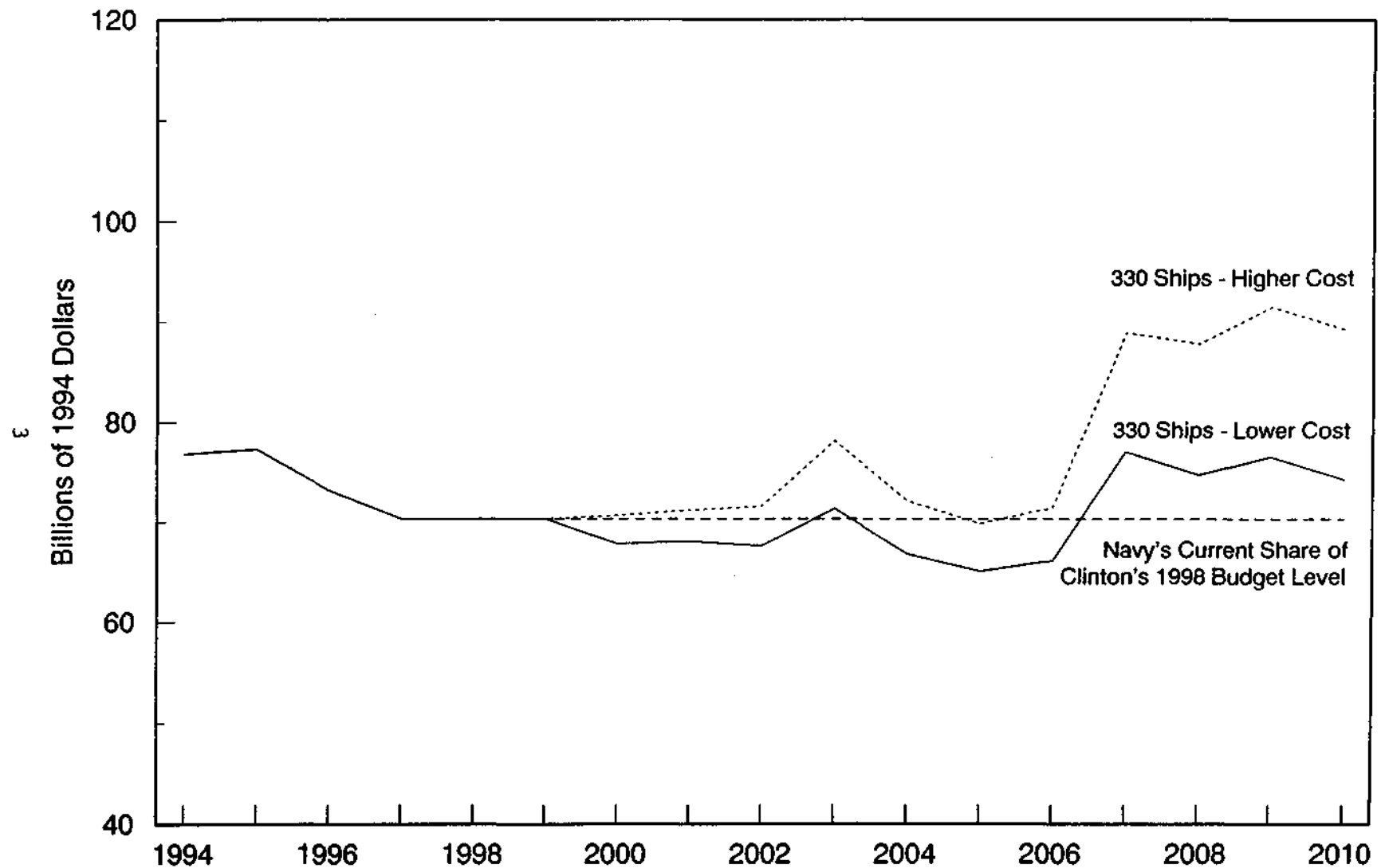
Under these assumptions, Department of the Navy budgets would need to average between \$68 billion and \$72 billion a year from 2000 to 2005 (see Figure 1). (Except where noted, all costs are in 1994 dollars of budget authority and include funding for both the Navy and Marine Corps.) Funding would need to average between \$74 billion and \$86 billion a year from 2006 to 2010, when the A/FX enters production and submarines are purchased in larger numbers.

Estimates of cost in this paper are presented in ranges. In each case, the lower estimate uses Navy estimates of unit costs for weapons. The higher estimate assumes that, consistent with past experience, unit procurement costs of new weapons exceed early estimates. The higher estimate also assumes that procurement costs that cannot be related directly to the number of ships and aircraft--such as the costs of supporting weapons and modifications--increase in relation to the costs of procuring ships and aircraft.

Affordability Outlook Brightens

At least through the middle of the next decade, the 330-ship Navy plan would be affordable under plausible assumptions about the availability of funds. Assume, for example, that through 2010 the defense budget remains at the level proposed by the Clinton Administration for 1998 and that the Navy retains the 30 percent share of this reduced budget that it had in the budget for national defense in 1993. In that case, about \$70 billion would be available for Navy programs each year (see Figure 1). Even under the higher estimate of costs, this sum would be roughly sufficient to finance the Navy's reported plan through the first half of the next decade. During the second half of the next decade, there could be shortfalls in funding under both esti-

Figure 1: The Navy's Budget Outlook for a 330-Ship Fleet



SOURCE: Congressional Budget Office.

NOTE: Level of 1995-1998 funding represents the Navy's share of Clinton Administration's proposed budget for function 050 (national defense), based on Navy's share of the 1993 budget.

mates. Growth in the U.S. economy, however, could permit the overall defense budget and the Navy's budget to rise in those distant years.

This is a significantly brighter outlook than the one published in December 1991 by the Congressional Budget Office (CBO). That analysis, which was based on Navy plans as of 1991, anticipated shortfalls in funding beginning in the late 1990s.² Shortfalls would have increased sharply throughout much of the next decade. Under some assumptions, required funding would have exceeded the funds likely to be available by as much as one-half.

Several factors have improved the outlook. The planned size of the fleet has fallen faster than likely long-term budgets. Sharp cuts in the expected fleet size have delayed the need to buy expensive ships, particularly attack submarines and surface combatants. Also, the Navy has scaled back its plans for modernizing aircraft. The Navy has apparently decided to forgo modernization altogether for many types of aircraft (including P-3, S-3, E-2C, and EA-6B aircraft), at least through 2010, and will instead extend service lives through modification programs.

Affordability Not Assured in the Long Run

It is too soon, however, to conclude that the Navy has solved its future affordability problems.

Bow Wave of Costs Looms. Under the Navy's possible plan for a 330-ship fleet, a surge ("bow wave") of required funding develops during the second half of the next decade. In that period, the wave is high enough to raise costs above the level of funds that would be available assuming planned defense budgets and the Navy's share of them (based on its share of the 1993 budget for national defense). This problem is many years away. But the bow wave of costs will be caused by weapons that are being developed today, including the A/FX aircraft. Thus, the wave should be kept in mind during debate about those weapons. The bow wave might also arrive sooner than expected if the Navy begins procuring A/FX aircraft earlier than the end of the next decade to meet needs for medium-range bombers. Problems associated with an aging fleet of aircraft could also require larger purchases of aircraft than those assumed under the Navy's possible plan.

2. Congressional Budget Office, "The Costs of the Administration's Plan for the Navy Through the Year 2010," CBO Staff Memorandum (December 1991).

Plans Could Change. The Navy has not formally proposed a fleet of 330 ships. Nor has the Administration or the Congress approved such a plan. If the proposal eventually submitted to the Congress calls for a larger fleet--perhaps in response to adverse events in Russia--then affordability could remain a problem. For example, even during the first half of the next decade, the cost of buying and operating a 420-ship Navy would average \$88 billion a year under the higher cost assumptions. That amount would exceed by about 26 percent the funds likely to be available assuming planned budgets and the Navy's share of them based on its 1993 budget share. Shortfalls could reach 44 percent during the second half of the decade.

Further Budget Cuts Could Cause Problems. Although they would substantially reduce the deficit, the fiscal proposals recently offered by the Clinton Administration would not fully resolve this country's long-term deficit problem.³ If there is another round of budget cuts, including further cuts in defense funding, affordability problems could quickly reappear. If, for example, during the next decade the Navy receives its current share of a national defense budget of \$200 billion, Navy funding would total about \$60 billion a year. This level would be insufficient to finance its possible plan for 330 ships, particularly under the higher estimate of costs.

ASSUMPTIONS ABOUT POSSIBLE NAVY PLAN FOR A 330-SHIP FLEET

The Clinton Administration will not release its long-term plans for naval and other defense forces until later this year or early next year. The Congress, however, is currently debating the 1994 budget request, which includes substantial funding to develop weapons that will be bought later in the 1990s and in the next decade. In order to provide some assessment of the long-term costs and affordability of those weapons, CBO has made assumptions about possible Navy plans. Where possible, these assumptions are consistent with Navy statements about its likely plans.

Several key factors influence the long-term costs of the Navy: numbers of forces (ships and aircraft), plans for modernizing the forces with new weapons, and the expected cost of those weapons. How would each factor fare under the possible Navy plan?

3. Congressional Budget Office, "An Analysis of the President's February Budgetary Proposals," CBO Paper (March 1993).

Numbers of Forces

The Clinton Administration's 1994 budget request would reduce the number of Navy battle force ships from 443 in 1993 to 413 in 1994. The force would include 12 aircraft carriers (there would be no training carrier) and 13 air wings.

According to recent press reports, the Navy is considering making significantly larger cuts in the number of ships in its fleet. If this plan is adopted, the force would decline from 413 ships in 1994 to about 330 vessels by 1999.⁴ The 330-ship fleet would reportedly include 12 carriers (with no training carrier), 91 surface combatants, 48 attack submarines, 50 amphibious ships, and 18 ballistic missile submarines.

Although these numbers are based on press reports, the possible Navy plan is roughly consistent in both size and composition with recommendations made last year by Secretary of Defense Les Aspin when he was Chairman of the House Armed Services Committee. Aspin recommended a fleet of 340 ships as part of his so-called Option C for military forces.⁵ The recommended fleet included 12 carriers, 50 assault ships (that is, amphibious ships), and 40 attack submarines. These numbers are quite similar to the ones in the Navy's possible plan. Moreover, during recent Congressional testimony, a senior Navy official, while not publicly confirming this plan, did acknowledge the possibility of reducing the size of the fleet to levels in the neighborhood of 330 ships.⁶

Costs are influenced not only by the size of the planned fleet but also by its composition. Neither the Navy nor press reports have detailed which ships would be cut from the fleet if it declined to about 330. In general, for this analysis, CBO assumed that the Navy would retire the oldest and least capable classes of ships first. To reach the force goal of 91 surface combatants, CBO assumed that by 1999 the Navy would retire 18 older guided missile cruisers (CGs), 5 of the oldest nuclear-powered cruisers (CGNs), and 50 frigates, the least capable and slowest ships, which are used primarily for antisubmarine warfare. To reach the force goal of 48 submarines, CBO

4. Press reports vary from about 320 to 350 in their estimates of the number of ships the Navy is planning. See "Navy Plan Forecasts Radical Changes for Service During the 1990s," *Inside the Pentagon*, March 25, 1993; and "Dellums Questions Whether Navy Needs 12 Carriers," *Aerospace Daily*, April 1, 1993. CBO chose to estimate costs based on maintaining 330 ships in the fleet.

5. See Representative Les Aspin, Chairman, House Committee on Armed Services, *An Approach to Sizing American Conventional Forces for the Post-Soviet Era: Four Illustrative Options*, February 25, 1992.

6. See the testimony of Admiral Frank Kelso, Chief of Naval Operations, before the Subcommittee on Military Forces and Personnel, House Committee on Armed Services, March 9, 1993.

assumed that the Navy would retire the Permit, Sturgeon, Benjamin Franklin, and Narwhal classes, totaling 36 vessels, and the 16 oldest Los Angeles class (SSN-688) submarines.

Costs are also affected by the numbers of air wings (the groups of planes that are assigned to aircraft carriers). Under its possible plan, the Navy would apparently retain its current 13 air wings, including 11 wings in the active forces and 2 in the part-time reserves. The composition of the air wings might change, however. Consistent with informal statements by the Navy, this paper assumes that the Navy reduces the number of fighter and attack aircraft in each of the carrier-based air wings from roughly 60 today to about 50 for much of the period of this analysis. The analysis also assumes other reductions in naval air forces, including cutting Marine Corps fighters and land-based P-3 antisubmarine warfare squadrons.

Modernization

The long-term costs of the Navy are heavily influenced by decisions about the number and nature of the ships and aircraft that are purchased to modernize the fleet.

Ship Procurement. Although this paper focuses on plans and costs during the next decade, it must make assumptions about the number of ships bought during intervening years because those purchases influence long-term requirements. The estimates of ship procurement between 1994 and 2002 used in this paper come from press reports about possible Navy plans. Those reports suggest that the Navy would purchase two carriers, a small number of new attack submarines, and a substantial number of surface combatants (DDG-51s).

Beyond 2002, a period not covered in any press reports, CBO assumes ship procurements at a level needed to meet the requirements of a 330-ship fleet. Many older ships are assumed to be retired before the end of their planned service lives (typically 45 years for carriers, 30 years for submarines, and 20 to 40 years for surface combatants). Construction of new ships begins in time to maintain the goals for specific types of ships enumerated in the possible Navy plan and noted above. In the case of surface combatants and attack submarines, the current inventory of vessels, plus those bought during the 1990s, would be sufficient to maintain a fleet of 91 surface combatants and 48 attack submarines even if there were no new procurement until 2007 for surface combatants and no new procurement until 2005 for attack submarines.

Such a gap in procurement, however, would deactivate much or all of the shipbuilding production base that builds these vessels and their components. This paper assumes that, to sustain the production base, the Navy alternates between buying one or two surface combatants (DDG-51 class destroyers or their successor) a year from 2001 to 2010 and procures one attack submarine (the new Centurion class) every other year from 2000 to 2006. After 2006, as replacements for Los Angeles class submarines are needed, Centurion purchases rise gradually to three per year.

The number of ship purchases that result from these assumptions is fairly small, amounting to an average of about seven a year from 2000 to 2010 (see Table 1). During that period, the Navy would buy three aircraft carriers to maintain 12 carriers in the fleet. Also, to replace retiring vessels, it would purchase eight ballistic missile submarines starting in 2003 and three LHD amphibious assault ships late in the decade.⁷ Finally, CBO assumes that the Navy will build 18 DDG-51 class destroyers and successor ships and 15 Centurion attack submarines during the period.

Aircraft Procurement. Last year, the Navy provided CBO with plans for procuring fighter and attack aircraft. For the purposes of this paper, CBO adjusted those plans to reflect changes that have been discussed by the Navy since then.

The resulting plan assumes that the only fixed-wing combat aircraft purchased during the 2000-2010 period would be the F/A-18E/F fighter/attack aircraft and the A/FX strike/fighter aircraft. The analysis also assumes that the Marine Corps buys the V-22 tilt rotor aircraft to transport troops and equipment (see Table 2). CBO used the production schedule for the F/A-18E/F provided by the Navy in 1992. This schedule, which begins procurement in 1997, projects a gradual increase in purchases from 30 aircraft in 2000 to 72 by the year 2007; total purchases during the period amount to 606 aircraft. CBO also used a Navy production schedule from last year for the A/FX but delayed its start from 2001 to 2007 based on recent statements of Navy intentions as reflected in press reports. The resulting A/FX schedule starts procurement in 2007 with 6 aircraft and increases purchases to 18 in 2009, for a total of 54 aircraft during the period. The Bush Administration proposed terminating the V-22 aircraft. But many in the Congress supported

7. The procurement of ballistic missile submarines may be delayed if Trident submarines last longer than their expected 30-year service life. The Navy hopes they can remain operational for 40 years, but it will not know if the expected life of the submarine can be prolonged until the reactor core is examined during the nuclear refueling of each vessel in the middle of its life.

TABLE 1. NUMBER OF SHIPS THAT NAVY WOULD PURCHASE FROM 2000 TO 2010 UNDER POSSIBLE PLAN FOR A 330-SHIP FLEET

Designator	Type of Ship	Number Purchased from 2000 to 2010
ADC(X)	Dry Cargo	4
AGF	Command Ship	1
AOE	Fast Combat Support	6
AR	Repair Ship	2
AS	Submarine Tender	2
ATF	Fleet Tug	2
ATR	Rescue and Salvage Ship	3
CVN	Aircraft Carrier	3
DDG	Guided Missile Destroyer	18
LHD	Amphibious Assault Ship	3
LX	New Amphibious Assault Ship	9
SSBN	Ballistic Missile Submarine	8
SSN	Centurion Attack Submarine	<u>15</u>
Total		76

SOURCES: Congressional Budget Office based on press reports about possible Navy plan.

its procurement, as did President Clinton during his campaign. CBO therefore assumes that V-22 aircraft are part of the Navy's possible plan. CBO used an illustrative production schedule for the V-22 that begins procurement in 1997 and increases production from 20 aircraft in 2000 to 48 in 2010, for a total of 400 aircraft bought during the period.

TABLE 2. NUMBER OF AIRCRAFT THAT NAVY WOULD PURCHASE FROM 2000 TO 2010 UNDER POSSIBLE PLAN FOR A 330-SHIP FLEET

Designator	Type of Aircraft	Number Purchased from 2000 to 2010
A/FX	Medium Attack/Fighter	54
ATSA	Advanced Tactical Support Aircraft	0
V-22	Tilt Rotor Transport	400
F/A-18E/F	Fighter/Attack	606
P-7A	Antisubmarine Warfare	0
STOVL	Short Take-Off and Vertical Landing	0
T-45TS	Training	<u>12</u>
Total		1,072

SOURCE: Congressional Budget Office based on Navy's plans for procuring fighter and attack aircraft.

At least through 2010, the Navy is not assumed to purchase any other new types of fixed-wing combat or transport aircraft. It would buy 12 T-45 training aircraft, completing purchases planned under the Bush Administration. But there would be no purchases of new planes to replace land-based P-3 antisubmarine warfare aircraft or the carrier-based fleets of the S-3 antisubmarine warfare aircraft, the EA-6B electronic warfare aircraft, or the E-2C airborne command post.

Unit Procurement Costs

The unit (per-item) procurement costs of new weapons are another key factor that influences costs. Because unit costs are uncertain, CBO made estimates under two assumptions. The lower estimates are generally based on Navy estimates of likely unit costs. In some cases--for example, the successor to the DDG-51 destroyer--the Navy plans to deploy ships that are cheaper than the current version. The lower estimates therefore assume that the Navy puts in place policies that hold down procurement costs by designing new weapons that are cheaper or by avoiding unplanned growth in their cost. The higher estimates assume that, consistent with past experience, unit costs for procuring ships and aircraft exceed original estimates. The appendix discusses these assumptions in more detail.

Effects on Capability

This paper does not focus on assessing the capabilities of the Navy's possible plan. Reducing the size of the fleet to 330 ships would, however, reduce the wartime capability of the Navy compared with the current force or the one proposed by the Bush Administration. The possible Navy plan would also result in less peacetime presence of U.S. naval forces overseas. Although the number of carrier battle groups would remain at the 1994 level of 12, the 330-ship plan would reduce the number of surface combatants and submarines that could conduct peacetime-presence missions independent of the battle groups.

The possible Navy plan would also result in an aging fleet of naval aircraft. If the Navy retains enough aircraft to meet all of the requirements under its reported plan, the average age of the service's fleet of fighter and attack aircraft would rise from about 9 years today to more than 15 years by 2010.⁸ Although chronological age may be a useful measure of technological obsolescence, numbers of flight hours are a better measure of wear and tear. By this measure, too, the Navy's fleet would age noticeably. By 2010, assuming current rates of use, almost 50 percent of all fighter and attack aircraft would have exceeded their planned service lives, measured in terms of flight hours.

Aircraft other than those in the fighter and attack fleets would also age under this possible Navy plan. For example, by 2010, some antisubmarine warfare aircraft (P-3s and S-3s)--if not retired--could approach 40 or more years in age, truly venerable ages for planes.

While significantly smaller and older, the fleet available under the Navy's possible plan may provide adequate capability in an era when the threats to U.S. security have dropped sharply. For example, older aircraft fleets, though technologically less sophisticated than newer fleets, may be acceptable because the regional powers that now seem to be the most likely adversaries of the United States are not likely to have sophisticated aircraft in their inventories.

8. Testimony by Robert F. Hale, Assistant Director, National Security Division, Congressional Budget Office, before the Subcommittees on Military Acquisition and on Research and Technology, House Committee on Armed Services, April 28, 1993.

LONG-TERM COST OF POSSIBLE NAVY PLAN

How much would this plan for a 330-ship Navy cost over the long term? CBO's estimates suggest that its costs would be relatively modest during the first half of the next decade but would rise significantly during the second half.

Costs During the First Half of the Next Decade

From 2000 to 2005, the Department of the Navy would require funding of \$68 billion a year, on average, under the lower cost assumptions in this paper and \$72 billion a year under the higher cost assumptions (see Figure 1 on page 3). (Except where noted, long-term costs in this paper are expressed in 1994 dollars of budget authority. Budget authority is for the Department of the Navy and thus includes funding for the Marine Corps.)

The lower of these cost estimates assumes the smaller estimates of unit procurement costs of new weapons, which are generally based on Navy plans. Lower estimates also assume that those procurement costs that cannot be related directly to the number of ships and aircraft--such as costs for supporting weapons and modifications--return to the historical average of 1974-1993, adjusted for changes in the size of the fleet. Research and development costs under the lower estimate are assumed to return to the average level experienced during the 1974-1993 period. Finally, the lower estimates assume that the overhead portion of operating costs--defined as those operating costs that cannot be related directly to numbers of forces--fall in proportion to cuts in those parts of the operating budgets that do vary with forces. The appendix discusses these assumptions in more detail.

The higher cost estimates in this paper assume larger estimates of unit procurement costs, based on unplanned cost growth. Procurement that cannot be directly related to numbers of ships and aircraft is presumed to increase in relation to the costs of procuring ships and aircraft, as has typically happened in the past. Funding for research and development is assumed to retain the same share of Navy budgets that it received on average during the 1974-1993 period. Under the higher estimate of costs, no reductions are assumed in overhead costs.

During the first half of the next decade, the funding needed for a 330-ship fleet under both the lower and higher assumptions is generally smaller than the \$77 billion in Navy funding requested by the Clinton Administration for 1994. Required budgets during the first half-decade are generally about the same as those the Navy might expect by the late 1990s. The Clinton Administration's plan projects \$234 billion in national defense funding for

1998 but does not yet indicate the portion that will be allocated to the Navy. In 1993, however, the Navy received about 30 percent of total defense funding. If it retains that share, the Navy budget in 1998 would be \$70 billion.

The amount of funding required by the Navy does not grow substantially during the first half of the next decade because of the limited need to buy new ships and aircraft. During those years, CBO projects that the Navy would need to procure an average of only six ships per year. The shipbuilding and conversion (SCN) budget associated with those ships would average between \$6.8 billion and \$8.1 billion per year, depending on whether the lower or higher cost assumptions are used.

The low level of ship procurement from 2000 to 2005 reflects a sharp reduction in the need for surface combatants and attack submarines. Requirements for surface combatants decline further because the Navy is assumed to have bought large numbers of DDG-51 destroyers throughout the 1990s. Even if the Navy bought no DDG-51s after 1993, the Navy would not need to purchase any new surface combatants until about 2007 except to maintain the industrial base. Nor would it have to buy any attack submarines until 2005.

Total Navy costs during the first half of the next decade are relatively steady from year to year. According to press reports, the Navy would order one aircraft carrier--by far the most expensive single ship in the fleet--in 2001, a year in which only two other ships would be purchased. There is, however, a spike in costs in 2003 because the Navy is assumed to purchase a second aircraft carrier along with five other ships. The required funding in 2003 would rise to between \$71 billion and \$78 billion (see Figure 1 on page 3). The Navy could alter the exact year in which it buys the second carrier, but a spike in required funding would be likely to occur sometime during the period from 2002 to 2006 if the Navy intends to maintain 12 carriers in the fleet.

Low to moderate aircraft procurement costs associated with the possible Navy plan would also hold down Navy budgets during the first half of the next decade. During that period, the F/A-18E/F and the V-22 would be the only major fixed-wing aircraft in production. Required funding for the Navy's combat aircraft would average \$4.4 billion per year under the assumptions of the lower cost estimates and \$6.1 billion per year under the higher assumptions.

Costs During the Second Half of the Next Decade

In the second half of the next decade, the Navy would need significantly higher funding for a 330-ship plan than during the first half of the decade. Between 2006 and 2010, Navy requirements would average \$74 billion a year under the lower estimate and \$86 billion under the higher one. Several factors explain the increase in costs. In 2007, the A/FX aircraft is assumed to enter production, which adds substantially to costs. Also, rather than buying Centurion submarines at a rate of one every other year to maintain the industrial base, in 2007 the Navy must begin increasing its purchases to reach three vessels a year to sustain the attack submarine fleet at 48 vessels. Finally, the Navy would purchase a third aircraft carrier in 2007 in order to keep its total fleet at 12 carriers.

As a result, the Navy's average funding for the SCN account during the second half of the next decade would jump to \$10.3 billion a year using the lower cost assumptions and \$12.7 billion using the higher ones. Average funding for combat aircraft would rise to between \$6.6 billion and \$9.1 billion over the same period. These figures are substantially larger than comparable estimates for the first half of the decade.

Availability of Funds

Would enough money be available to cover these projected funding requirements? During the first half of the next decade, the answer is probably yes, at least under plausible assumptions about the availability of funds. Assuming, for example, that during the next decade the total budget for national defense (budget function 050) remains at the level of \$234 billion, the amount proposed by the Clinton Administration for 1998, and assuming that the Navy receives about 30 percent of that budget, consistent with its share in 1993, the Navy would have about \$70 billion available per year (see Figure 1 on page 3).

During the first half of the next decade, funding of \$70 billion would be about the same as the average amount needed for the possible Navy plan under the higher cost assumptions (\$72 billion a year). Available funds would be greater than the amount required (\$68 billion a year) under the lower assumptions.

The budgetary situation would be less optimistic during the second half of the decade. Were budgets to average \$70 billion a year in those years, shortfalls would occur under both lower and higher assumptions. Under the assumptions of lower cost, required funding would average \$74 billion, or

about 6 percent more than the funds available. If unit costs of new weapons exceed their initial estimates and if the cost of buying supporting equipment also increases, the required funding would average \$86 billion a year, exceeding the amount likely to be available by \$16 billion a year, or 23 percent.

This shortfall could be made up, however, by increases in the Navy's share of the total defense budget. Between 1974 and 1993, the Navy's share of the total budget for national defense has been as high as 36 percent. This higher share would finance the Navy's possible plan even under the higher cost assumptions.

The Navy could also finance its possible plan without an increased share of the budget if the overall defense budget grows. CBO generally assumes that, over a long period, U.S. gross domestic product (GDP) will grow at approximately 2 percent a year, adjusting for inflation. If the defense budget retains its 1998 share of GDP, while GDP grows at 2 percent a year, then by the second half of the next decade, the Navy could finance its plan even if the service's share does not rise.

COMPARISON WITH THE NAVY'S 1991 PLAN

The affordability picture for the possible 330-ship Navy plan is considerably brighter than for Navy plans under the Bush Administration. In December 1991, CBO analyzed the long-term cost and affordability of Navy plans as of 1991.⁹ The analysis concluded that, compared with the 1997 level of Navy funding planned by the Bush Administration, required Navy budgets would exceed available funds starting toward the end of the 1990s (see Figure 2). By the middle of the next decade, shortfalls would have amounted to \$8 billion under the lower estimate of costs and \$25 billion under the higher estimate. By 2010, shortfalls would have ranged from \$10 billion to \$32 billion. (Costs associated with this December 1991 analysis are expressed in constant 1994 dollars of budget authority.) By contrast, despite cuts in planned defense spending from the levels projected in 1991, today's possible Navy plan appears affordable under plausible assumptions at least through the middle of the next decade.

In broad terms, the affordability picture improves because planned cuts in forces are larger than planned cuts in budgets. Compared with the 1991 Navy plan, the possible Navy plan in this paper eventually reduces the size of

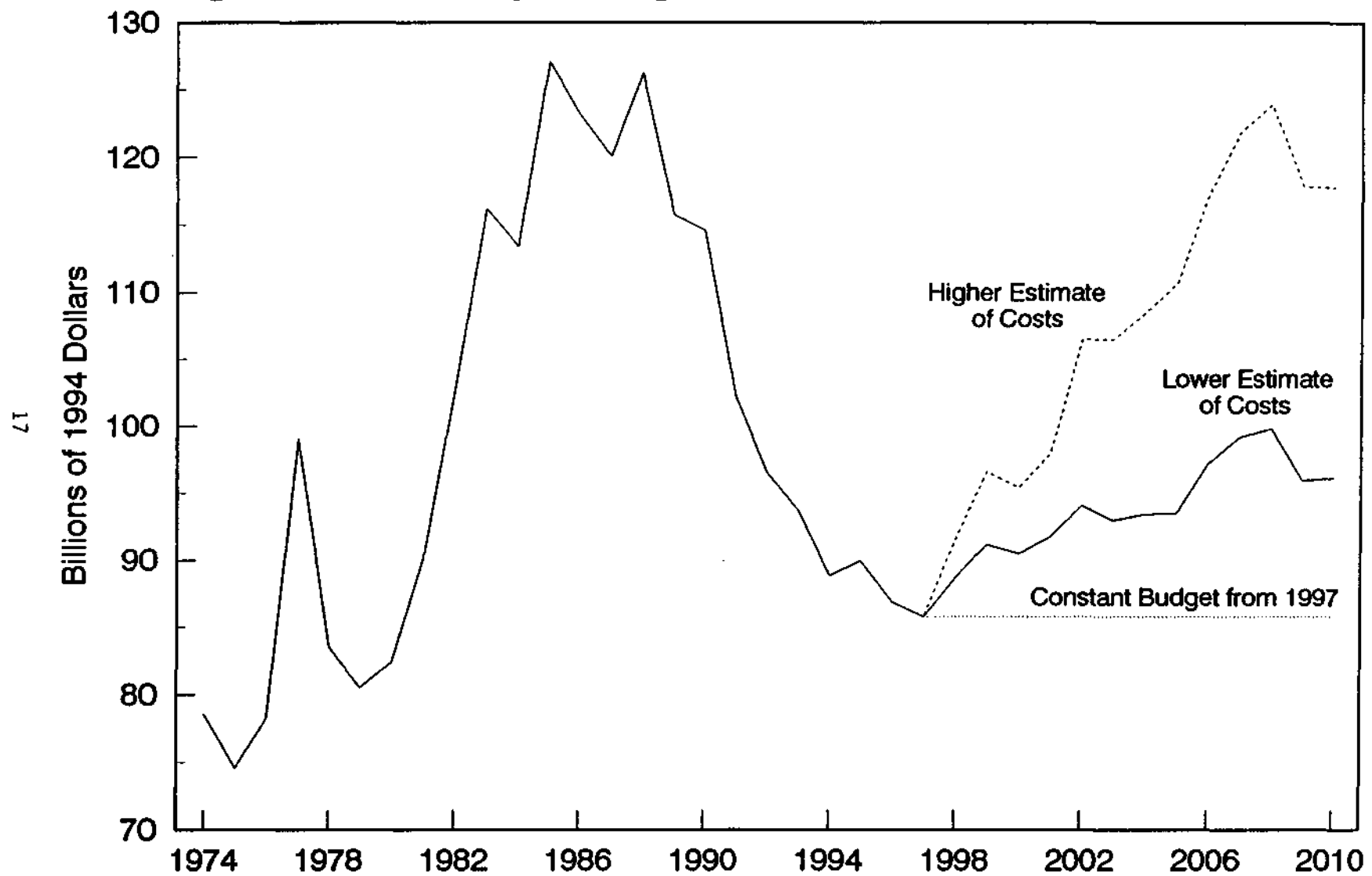
9. Congressional Budget Office, "The Costs of the Administration's Plan for the Navy Through the Year 2010," CBO Staff Memorandum (December 1991).

the fleet by 27 percent (from 450 ships to about 330 ships). The expected level of the Navy's long-term budget, however, falls by only 19 percent (from \$86 billion to \$70 billion).

More specifically, affordability improves because, at least through 2010, the smaller fleet under the Navy's possible plan sharply reduces the need for new ships. Procurement of DDG-51 destroyers (and their successor) averages 1.6 per year under the Navy's possible plan, compared with 3 per year under the 1991 plan (see Table 3). Procurement of Centurion attack submarines averages 1.4 per year compared with 3.

The possible Navy plan also alters plans to modernize the Navy's aircraft—an important change, but one that is not related to the reduction in the size of the fleet. In some cases, the changes in plan result in increased costs. For example, during the next decade the possible Navy plan buys more F/A-18 aircraft than the 1991 plan did (see Table 3). The new plan also buys some V-22 aircraft, whereas the 1991 plan bought the less expensive CH-60 helicopters. In most cases, however, the new plan alters aircraft procurement in ways that reduce costs. Procurement of the expensive A/FX medium-attack aircraft is assumed to be delayed until 2007, six years later than the 1991 plan's initiation of production in 2001; average purchases during the next decade are therefore much lower under the new plan than under the 1991 version. Also, in a sharp departure from its 1991 plan, the Navy now expects no procurement of the advanced tactical support aircraft as a replacement for the P-3, S-3, E-2C, or EA-6B fleets, at least through 2010.

Figure 2: The Navy's Budget Outlook Under the 1991 Plan



SOURCE: Congressional Budget Office, "The Costs of the Administration's Plan for the Navy Through the Year 2010," CBO Staff Memorandum (December 1991).

**TABLE 3. AVERAGE ANNUAL PROCUREMENT OF
SELECTED WEAPON SYSTEMS, 2000-2010**

System	Navy's 1991 Plan	Navy's Possible 1993 Plan
DDG-51 Destroyer and Successor	3	1.6
Attack Submarines	3	1.4
LHD Amphibious Assault Ship	0.3	0.3
A/FX Medium Attack/Fighter Plane	27	5
F/A-18	29	55
Short Take-Off and Vertical Landing Aircraft	20	0
V-22 Transport	0	36
CH-60 Helicopter	22	0
Advanced Tactical Support Aircraft ^a	9	0
P-3 Replacement	24	0

SOURCE: Congressional Budget Office based on press reports about possible Navy plans.

a. Would have replaced the S-3 antisubmarine warfare aircraft, the EA-6B electronic warfare aircraft, and the E-2C airborne command post.

POSSIBLE AFFORDABILITY PROBLEMS OF THE 330-SHIP PLAN

Although reported changes make the U.S. naval force structure less costly, it is too soon to conclude that affordability problems have disappeared. They will remain if the surge in costs during the second half of the next decade is deemed a concern, if plans to reduce the size of the fleet are not approved, or if the defense budget is eventually reduced by more than the Clinton Administration has proposed.

Bow Wave of Costs

As was noted above, required funding for the possible Navy plan increases during the second half of the next decade (see Figure 1 on page 3). Under the higher estimate of costs--which is the better estimate if history is a guide--a "bow wave" of costs could develop that would substantially exceed available funds.

The second half of the next decade is far away. Much could happen, in terms of Navy plans or changes in world events, that would render any concern about the higher costs moot. Moreover, as was noted earlier, an increase in the overall defense budget, or in the Navy's share of the defense budget, could provide the funding needed to finance the late-decade surge in costs.

The future bow wave, however, will be caused by weapons that are being developed now. Higher costs during the second half of the next decade reflect the initial procurement of the A/FX aircraft, the procurement of a third aircraft carrier in 2007, and increased purchases of the Centurion attack submarine. It may therefore be appropriate to keep the bow wave in mind during debate about the development funds for these weapons.

Moreover, this bow wave could arrive sooner than expected, which might render it of more concern. In estimating the cost of the Navy's possible plan, CBO assumed--based on press reports about Navy plans--that procurement of the A/FX medium-attack aircraft would not begin until 2007. This is a delay from last year's plans, when it was assumed to begin in 2001. The A/FX could probably be ready for production before 2007. In addition, the Navy recently stated that it plans to retire the older A-6 medium-attack aircraft in 1999. If it does, and A/FX procurement does not begin until late in the next decade, the Navy would have to operate its carrier air wings for about 10 years without the benefits of a medium-range bomber. These factors may argue for the Navy to change its plans and begin buying the A/FX well before 2007.

Indeed, last year the House Committee on Armed Services expressed concern about waiting even until 2001 to begin procurement of the A/FX.¹⁰

If A/FX procurement begins earlier, with funding for initial production starting in 2003, cost estimates for the Navy's possible plan would be higher by about \$3 billion to \$5 billion by the middle of the next decade, depending on whether lower or higher costs are used. These additional dollars would mean that the bow wave of costs under the Navy's possible plan would arrive sooner than would otherwise be the case.

The bow wave could also occur earlier, and could be larger, if problems with the aging of aircraft require the Navy to buy more planes than anticipated under the possible Navy plan. As was noted earlier, the chronological age of naval fighter and attack aircraft, and the fraction that are beyond the end of their planned service lives measured in terms of flight hours, both rise sharply under the possible plan. Other types of aircraft also get older. It is possible that the Navy will discover that it cannot safely and effectively operate these older aircraft. If so, aircraft purchases might have to be increased above those assumed in the Navy's possible plan. This action could add billions of dollars to costs. The added costs might be incurred beginning in the early part of the next decade.

Larger Naval Forces

Affordability could also be a problem if the United States decided to retain a fleet of substantially more than 330 ships. The Navy's possible plan is being reviewed within the Navy and by the Secretary of Defense during his "bottom-up" review of the defense budget. The Congress must also review the plan. The plan might not be approved. Policymakers might conclude that, if the United States is to remain a superpower, it must have a Navy with more than 330 ships. Perhaps more likely is that uncertainty about developments in Russia, or an actual crisis there or elsewhere in the world, could create a desire to maintain larger naval forces.

To illustrate the effects of such a decision, CBO estimated the long-term cost of a fleet of 420 ships with 12 carriers. This force is similar in size to the one that would eventually have resulted from the Navy's 1991 plan. That plan called for a fleet of 450 ships, including 12 carriers, 80 attack submarines, 150 surface combatants, and 50 amphibious ships. It did not replace vessels on a one-for-one basis, however. As a result, CBO estimated that the fleet would

10. House Committee on Armed Services, *National Defense Authorization Act Report for Fiscal Year 1993*, Report 102-527 (May 19, 1992), pp. 11-12.

eventually have declined to about 420 vessels by 1999, and further by the year 2010. To simplify the analysis, CBO looked at the costs of a 420-ship fleet only under the higher cost assumptions discussed above.

During the first half of the next decade, this 420-ship fleet would require average funding of \$88 billion a year under the higher assumptions (see Figure 3). During the second half of the decade, required funding would jump to an average of \$101 billion a year. Compared with the possible Navy plan, costs for the 420-ship fleet are higher because of the extra costs to operate the larger fleet and because more ships must be procured to maintain it. Costs for procuring aircraft do not change because the Navy will need to buy the same quantities of aircraft to equip the 12 carriers included in both the 330- and 420-ship forces. Also, CBO assumes that the decision not to modernize the Navy's fixed-wing aircraft fleets, other than the fighter and attack fleet, remains unchanged whether the Navy has 330 or 420 ships.

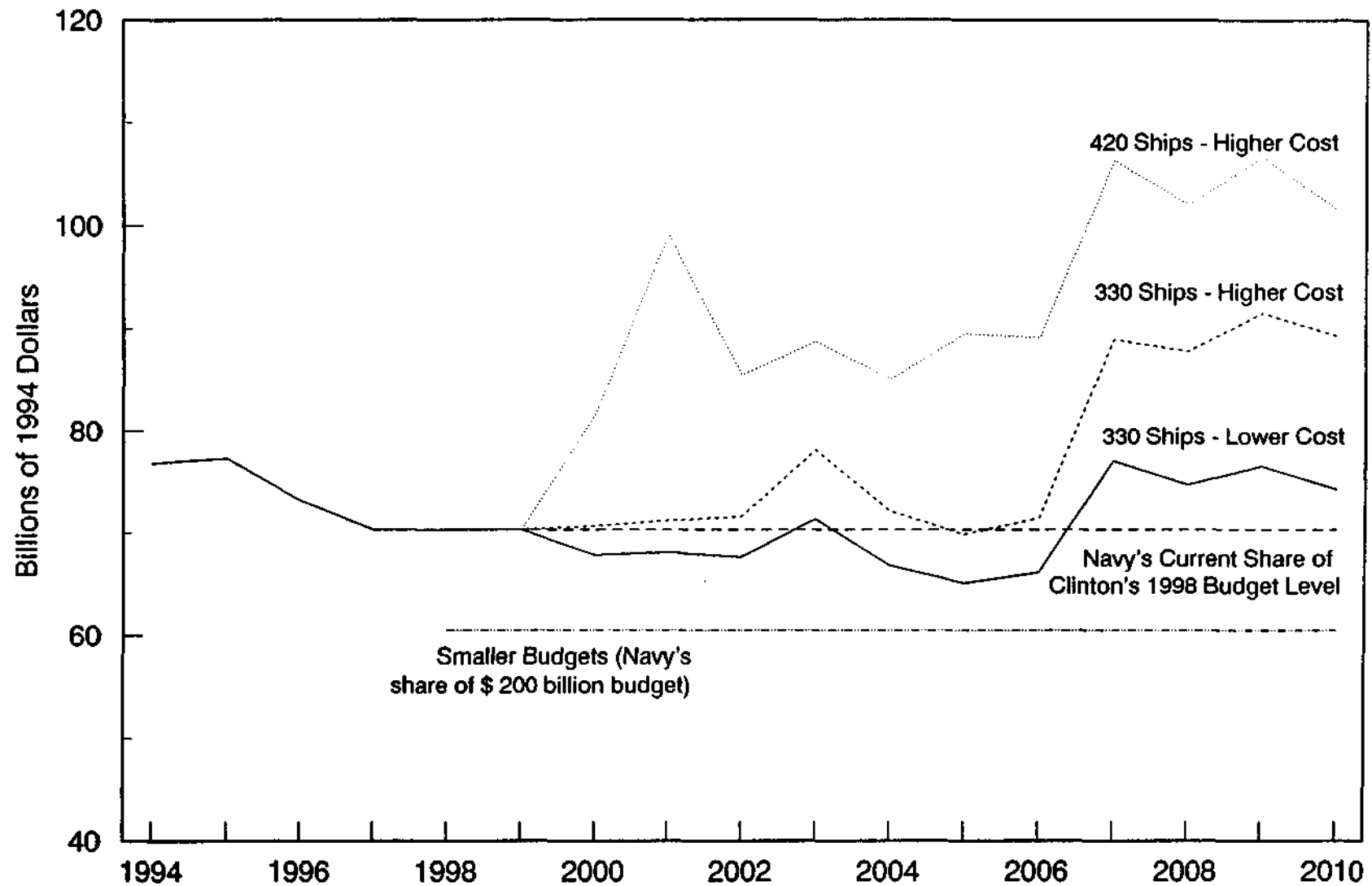
During both halves of the next decade, the funding levels required to pay for the 420-ship fleet would exceed available funds, assuming the Clinton Administration's planned budgets and the Navy's share of those budgets based on its share of the 1993 budget for national defense. During the first half of the decade, required funding would exceed the \$70 billion available by \$18 billion a year. That shortfall would rise to \$31 billion during the second half.

Further Cuts in the Defense Budget

The long-term affordability of naval forces might also be called into question if future policymakers cut the defense budget more deeply than the Clinton Administration proposes. The Administration's fiscal proposals would substantially reduce the U.S. deficit by the late 1990s. But they are not enough to solve the long-term deficit problem.¹¹ In fact, in its 10-year budget outlook, CBO projects that if no concerted effort is made by policymakers to reduce it, the deficit will increase in both dollar terms and as a proportion of GDP. In terms of current dollars, the deficit is projected to increase from \$302 billion in 1993 to \$655 billion in 2003. As a percentage of GDP, the deficit is projected to increase from 4.9 percent in 1993 to 6.8 percent in 2003. Eventually, therefore, pressure may build to enact further cuts in defense spending, which makes up a substantial portion of federal discretionary spending.

11. See Congressional Budget Office, "An Analysis of the President's February Budgetary Proposals," CBO Paper (March 1993).

Figure 3: The Navy's Budget Outlook with Larger Forces or Smaller Budgets



SOURCE: Congressional Budget Office.

NOTE: Level of 1995-1998 funding represents the Navy's share of Clinton Administration's proposed budget for function 050 (national defense), based on Navy's share of the 1993 budget.

If, for example, the budget for national defense (budget function 050) were eventually cut to \$200 billion per year, rather than the \$234 billion proposed by the Clinton Administration for 1998, even a 330-ship Navy probably would not be affordable (see Figure 3). Based on its 30 percent share of the 1993 national defense budget, the Navy's share of a \$200 billion defense budget would be \$60 billion. During the first half of the next decade, required funding would range from \$68 billion to \$72 billion, creating a shortfall of 13 percent to 20 percent. In the last half of the decade, required funding would average \$74 billion to \$86 billion, creating a shortfall of 23 percent to 43 percent.

RESOLVING AFFORDABILITY PROBLEMS

If affordability problems remain, the Navy could make several changes to bring its possible plan more into line with available funds. Those changes include allowing gaps in the production of some vessels, reducing the number of aircraft carriers, focusing naval aviation on shorter-range missions, and cutting the fleet size further. This section briefly discusses those changes but does not analyze them in detail.

Allow Gaps in Production Lines

Under the possible 330-ship plan, the Navy buys Centurion attack submarines and DDG-51 destroyers (or their successor) through 2005 and 2007, respectively, in order to maintain the U.S. industrial capability to produce those ships and their components. The total cost of these purchases ranges from \$24 billion to \$34 billion. The Navy could save those funds and still support a planned fleet of 330 ships by doing the following:

- o Terminating production of the DDG-51 after 1994 and delaying the procurement of its successor until 2007, and
- o Delaying the start of Centurion purchases until 2005.

Of course, reestablishing the production bases of these vessels when new ships are eventually needed would have substantial costs. But the costs are likely to be small compared with the savings of \$24 billion to \$34 billion. Ending production also adds a number of years to the time before new ships could be constructed and deployed. Also, the first ships delivered from a production line that had been closed for many years might not be of high quality.

Even if the production line is operating, however, the time required to build a DDG-51 destroyer or an attack submarine is already about five to six years. This interval is well beyond the warning time the Navy would be likely to have for a regional contingency and may be longer than the warning time before a major threat to U.S. security, such as a trend toward remilitarization in Russia. The added years required to restart ship production may therefore not be of great concern when weighed against the potential cost savings. The permanent erosion of the base of skills and technology needed to produce such complex ships may be of greater concern when considering gaps in the production line.

Reduce Number of Aircraft Carriers

If affordability problems loom, the Navy could also cut the number of aircraft carriers from 12 to 10. A fleet of 10 carriers was proposed by President Clinton during his campaign and was the minimum number proposed last year by Senator Sam Nunn, Chairman of the Senate Armed Services Committee. A reduction to 10 carriers would reduce operating costs for the carrier force and its associated air wings. The change would also lower procurement costs by permitting cancellation of the carriers that the Navy is projected to buy in 2001 and 2003 and, eventually, by reducing needs for aircraft.

Fewer carriers would mean less capability to bring extensive air power to bear during crises that occur with little notice. The Navy could, however, rely more heavily on configurations of ships other than the carrier battle group for both peacetime presence overseas and crisis response. Groups of ships and submarines centered around a cruiser or amphibious assault ship might fill this role. The Navy has already experimented with such new concepts for deploying forces.

Focus Naval Aviation on Shorter-Range Missions

The roles and missions of the services could be realigned so that the Air Force handled longer-range bombing missions while the Navy concentrated on shorter-range missions. Such a shift might permit cancellation of the A/FX aircraft, which is being designed to handle relatively longer-range missions. During the second half of the next decade, when the Navy's budgetary problems are likely to be the most severe, canceling the A/FX would reduce Navy funding requirements by about \$1.8 billion a year using lower cost assumptions and \$3.2 billion a year using higher cost assumptions.

Reduce Forces Further

The Navy could also reduce the size of its fleet below the level of 330 ships. If the number of carriers were reduced from 12 to 10, supporting ships in those two battle groups (including surface combatants, submarines, and replenishment ships) could also be reduced. Other types of ships might also be cut back. Indeed, according to a press report, the Navy anticipates a gradual decline to 280 ships by the year 2025.¹²

Any of these four revisions to the possible Navy plan--creating a gap in the production of destroyers and submarines, reducing the number of aircraft carriers, focusing naval aviation on shorter-range missions and eliminating the A/FX, or further reducing the number of surface combatants--could mitigate any affordability problems.

12. See "Navy Plan Forecasts Radical Changes for Service During the 1990s," *Inside the Pentagon*, March 25, 1993.

APPENDIX: COSTING METHODS AND SUPPLEMENTARY DATA

The Congressional Budget Office estimated the costs to maintain the 330-ship and 420-ship forces beyond 2000 using methods that vary according to the category of costs. In all cases, costs were based on budget authority and were calculated after adjustment to constant 1994 dollars. This appendix discusses CBO's estimating methods.

Ship Procurement (SCN)

In this paper, most categories of ship procurement were estimated explicitly. That is, CBO estimated the number of vessels that the Navy would have to purchase based on the desired size of the force and on the expected retirement age of existing weapons. (Table 1 on page 9 shows the number of ships that are assumed to be procured.)

For the 330-ship force, CBO assumed that the Navy would retire some weapon systems before the end of their expected service lives. This would be necessary to make the transition to new, lower force levels in a reasonable period of time. For example, reducing the force to 330 ships by 1999 would require the early retirement of some cruisers and frigates. In other cases, CBO had procurements beginning somewhat earlier than necessary in order to produce a reasonably smooth pattern of procurement.

CBO estimated the unit costs of ships in both lower- and higher-cost cases. In general, the lower-cost case used Navy estimates of unit costs. Where these were not available, CBO assumed that new ships would not cost much more than the systems they replaced. Under the higher-cost case, CBO assumed that unit costs would exceed the levels currently estimated by the Navy. Consistent with historical rates, CBO assumed an increase of 3 percent a year above planned estimates for the cost of procuring ships. Generally, the higher cost estimates exceed the lower ones by about 20 percent (see Table A-1).

TABLE A-1. UNIT PROCUREMENT COSTS FOR SHIPS
(In millions of 1994 dollars)

Designator	Type of Ship	Lower Unit Cost	Higher Unit Cost
ADC(X)	Dry Cargo Ship	500	600
AGF	Command Ship	350	400
AOE	Fast Combat Support Ship	550	650
AR	Repair Ship	500	600
AS	Submarine Tender	400	500
CVN	Aircraft Carrier (Nuclear)	4,100	4,900
DDG	Guided Missile Destroyer	600	850
LHD	Amphibious Assault Ship	1,650	1,950
LX	New Amphibious Assault Ship	650	800
SSBN	Ballistic Missile Submarine	1,700	2,000
SSN	Centurion Attack Submarine	1,300	1,600

SOURCE: Congressional Budget Office.

NOTE: Lower unit cost is based on Navy estimates. Higher unit cost assumes historical rates of cost growth.

CBO made an important exception to these rules in estimating the cost of the surface combatant that will replace the DDG-51. Because the Navy hopes to develop a lower-cost alternative to the DDG-51, the higher cost estimate reflects the current price of a DDG-51 (\$850 million per ship), while the lower cost estimate reflects a 30 percent reduction in costs for its successor (\$600 million). Based on press reports of what the Navy is planning, CBO assumed that procurement of the lower-cost successor begins in 2003.

Portions of the SCN account pay for modifications and overhauls of ships. These costs, which cover a wide variety of programs, were not estimated explicitly. Instead, funds projected to be spent for procuring major ships in each year of the Bush Administration's Future Years Defense Program (FYDP), submitted in January 1992, were divided by the projected funding in the SCN account for each year of that plan. The result was a ratio of funding for major ships to funding for SCN. CBO applied the average of the ratios for all years in the plan to the projected funding level needed to build major ships in the 2000-2010 period in order to derive estimates for the SCN accounts in those years. Modifications were included in the remainder of the SCN account. Also included in this portion of SCN were refueling

overhauls for nuclear-powered ships and service-life extension programs for conventionally powered vessels.

Aircraft Procurement (APN)

In contrast to ships, where procurement figures are based on the number of vessels needed to maintain required force levels, aircraft procurement is generally based on last year's service plans, adjusted where possible to reflect current plans. The assumptions about the number of aircraft procured are discussed in the text and shown in Table 2 on page 10.

Lower estimates of the unit costs of aircraft are generally based on service plans for phased procurement costs that CBO has updated based on publicly available information. In most cases, higher estimates, still based on phased procurement costs, assume that expenses rise in keeping with historical rates of cost increases. Aircraft costs typically rise from one generation to the next. CBO's estimates of higher costs assume about a 40 percent cost increase (see Table A-2).

A portion of the APN account provides funds for aircraft modifications and spare parts. As with ships, these funds were not estimated explicitly. Instead, they were included in CBO's estimates for nonmajor procurement, which are discussed below.

TABLE A-2. UNIT PROCUREMENT COSTS FOR AIRCRAFT
(In millions of 1994 dollars)

Type of Aircraft	Lower Unit Cost	Higher Unit Cost
A/FX	90	130
F/A-18E/F	60	80
V-22	40	50

SOURCE: Congressional Budget Office.

NOTE: Lower unit cost is based on Navy estimates. Higher unit cost assumes historical rates of cost growth.

Operation and Support Costs

This paper defines operation and support costs as expenses for military personnel and for the operation and maintenance of forces, including food, fuel, and pay for civilian employees. CBO estimated operating costs using its Defense Resource Model (DRM). The DRM is primarily a projection model rather than a predictive model. It does not predict future action by the Administration or the Congress, such as changes in operating tempos or reductions in costs achieved through efficiencies. Instead, the DRM projects costs based on current cost relationships that reflect the many personnel, facilities, and weapons policies affecting operating costs. Cost factors are computed on the assumption that the costs of operating a unit of force in the future--for example, an aircraft carrier or an air wing--are best measured by what the Navy now spends on that unit. When a new ship or wing enters the force, operating costs increase by the amount of the appropriate factor. Conversely, when an older weapon is retired, operating costs decrease by the amount of the appropriate factor.

CBO uses the DRM to estimate the incremental impact on the budget of changes in the number of forces. The cost estimates include changes in all of the operating categories that are directly or indirectly related to force levels, including costs for activities such as unit training, fuel, and portions of the training and medical care establishments.

CBO categorizes operating costs that cannot readily be related to ships or air wings--for example, remaining portions of the training and medical establishments, portions of base operating costs, and portions of administrative costs--as overhead. In its lower estimate of operating and support costs, CBO assumed that overhead costs fall in proportion to cuts in direct and indirect operating costs. Lower estimates therefore assume that, over a long period, the defense establishment can adjust its overhead activities fully to reflect lower forces. The higher estimates assume no reduction in overhead costs. This assumption is consistent with the presumption that--at least relative to the size of the reductions discussed in this paper--overhead costs are fixed.

Projections of future costs also depend on the costs to operate new weapon systems. Generally, cost estimates for operating new weapon systems are not available. Therefore, CBO usually assumes that a new weapon system will cost the same to operate as the one it replaces. For example, CBO assumed that the cost to operate an F/A-18E/F fighter/attack aircraft equals the cost to operate existing F/A-18 models in the fleet. This method results in a very conservative estimate, because new systems usually cost more to operate than older ones. In a few cases, CBO departed from this rule and made estimates using other systems as proxies for the new systems. For

example, CBO used estimates of the cost to operate the CG-47 cruiser as a proxy for the operating cost of the new DDG-51 destroyers, because the two ships are roughly the same size.

Other Costs

Some categories of costs are not directly related to the number of ships and aircraft. These include costs for nonmajor procurement, such as other procurement (OPN), weapons procurement (WPN), and Marine Corps procurement (PMC). The OPN account funds communications and support equipment and many other items; the WPN account finances missiles, torpedoes, guns, and ordnance; and the PMC account supports the procurement of ground weapons for the Marine Corps, such as vehicles, armaments, and ammunition. The general category of other costs also includes expenditures for research, development, test, and evaluation; military construction; and family housing. In some cases, these other categories were estimated in different ways under the lower- and higher-cost cases.

Nonmajor Procurement. The lower estimate treats nonmajor procurement costs as independent of those of major procurement. Under this method, purchases of items such as communications equipment, ordnance, and vehicles are not related to the amounts spent on ships and planes.

The lower estimate for nonmajor procurement is based on the average level of spending for these items from 1974 to 1993, adjusted for the declines in forces. Adjustments were based on changes in the numbers of people, ships, or air wings, depending on the purchase category.

Under the higher-cost case, CBO based its estimates for nonmajor procurement in a given year on the funding level for major procurement (major aircraft and shipbuilding and conversion) for that year and the previous year's spending on nonmajor procurement. An ordinary least squares regression equation using these variables was used to formulate the estimate and showed a statistically significant relationship for both of the variables. The regression is based on historical data for all of the variables for the years 1975 to 1993. The higher estimate reflects the notion, which seems consistent with past budgetary history, that parts of nonmajor procurement that pay for sophisticated support weapons--such as missiles and torpedoes--are likely to increase along with increases in spending for major ships and aircraft.

Research and Development. For the lower cost estimate, CBO assumed that research and development costs would, over a long period, return to their average historical level of the 1974-1993 period. For the higher cost estimate,

yearly costs for research and development for 2000 to 2010 were based on the average percentage of the Navy budget from 1974 to 1993 that was allocated to the research and development account--about 9.6 percent.

Military Construction and Family Housing. CBO used the same method to estimate military construction and family housing costs under both the lower and higher estimates. Both estimates assume that the costs would increase linearly from 1997 in the Bush Administration's FYDP to 2010. The estimate for 2010 is based on average funding during the 1974-1991 period, adjusted for changes in the number of active-duty military personnel.